IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Patent Application

Applicant(s): B. Rodrig et al.
Case: 3-7
Serial No.: 09/629,219
Filing Date: July 31, 2000
Group: 2616
Examiner: Donald L. Mills

Title: IP Multicast in VLAN Environment

APPEAL BRIEF

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

This Appeal Brief is submitted responsive to a non-final Office Action dated July 14, 2006 in the above-noted application. In the Office Action, the Examiner reopened prosecution responsive to a prior Appeal Brief filed April 19, 2006. The notice and brief fees previously paid in conjunction with the prior Appeal Brief should be applied to the present appeal. It is believed that no additional fees are due.

REAL PARTY IN INTEREST

The present application is currently assigned to Avaya Inc. or a subsidiary thereof. Avaya Inc. is the real party in interest.

RELATED APPEALS AND INTERFERENCES

There are no known related appeals or interferences.

STATUS OF CLAIMS

The present application was filed on July 31, 2000 with claims 1-49. Claims 18-25, 44 and 49 are canceled. Claims 1-17, 26-43 and 45-48 remain pending, with claims 1, 14, 26, 38, 45 and 48 being the independent claims.

Each of claims 1-17, 26-43 and 45-48 stands rejected under 35 U.S.C. §102(e) or §103(a). Claims 1-17, 26-43 and 45-48 are appealed.

STATUS OF AMENDMENTS

There have been no amendments filed subsequent to the appealed rejection.

SUMMARY OF CLAIMED SUBJECT MATTER

Independent claim 1 is directed to a method of determining local multicast information of a local area network (LAN), and includes the steps of dividing the LAN to a number of segments larger than the number of virtual LANs (VLANs) in the network, and creating a layer-3 multicast routing table, which relates to each of the segments separately. An example of a LAN of the type set forth in the claim is LAN 30 of FIG. 2, which includes layer-2 switch 36 and layer-3 switches 34X, 34Y and 34T. The LAN 30 comprises VLANs denoted A, B, C and D. One manner in which a multicast routing table of the type claimed may be created in one of the layer-3 switches 34 is described in the specification at page 11, line 24, to page 12, line 19.

Dependent claim 6 specifies that dividing the LAN to a plurality of segments comprises dividing at least one of the VLANs of the LAN to a plurality of segments. An example of a LAN divided in this manner is LAN 30 of FIG. 2. See the specification at, for example, page 11, lines 1-12.

Dependent claim 7 specifies that dividing the LAN to a plurality of segments comprises dividing such that each group of one or more links which connects two or more hosts, routers or layer-3 switches is a separate segment for each of the VLANs which pass on the group of links. An

example of a LAN divided in this manner is LAN 30 of FIG. 2. See the specification at, for example, page 11, lines 1-12.

Dependent claim 8 specifies that dividing the LAN to a plurality of segments comprises dividing such that, for each VLAN, a backbone segment is defined as including all the groups of one or more links which connect two or more routers or layer-3 switches in the VLAN. An example of such a backbone segment is backbone segment 116 in network 100 of FIG. 5. See the specification at, for example, page 17, lines 11-21.

Dependent claim 9 specifies that the links not included in the backbone segment for each VLAN are divided to separate segments in each VLAN, each segment including a group of one or more links which connect one or more hosts to a router or layer-3 switch. Network 100 in FIG. 5 comprises a backbone segment 116 and supports a single VLAN including the backbone segment and additional segments. See the specification at, for example, page 17, lines 11-21.

Independent claim 14 is directed to a method of forwarding multicast packets by a layer-3 switch, and includes the steps of receiving a multicast packet by the switch through a first physical port on a first VLAN, and routing the multicast packet in layer-3 out a second physical port of the switch, on the first VLAN. The claim further specifies that the multicast packet is bridged in layer-2 through a third physical port of the layer-3 switch. Illustrative embodiments of the layer-3 switch recited in this claim may be one or more of the layer-3 switches 34X, 34Y and 34T of FIG. 2. See the specification at, for example, page 15, lines 13-14.

Independent claim 26 is directed to a switch comprising a plurality of ports, a layer-2 bridging unit which bridges packets between the ports responsive to their destination media access control (MAC) address and their VLAN, and a multicast detector which identifies a group of at least some of the IP multicast routing related packets received by the switch, the group including Internet group management protocol (IGMP) queries, and prevents the layer-2 bridging unit from bridging the identified packets at least through ports which do not lead to at least one neighboring layer-3 switch or router. Illustrative embodiments of the switch recited in this claim may be viewed as one or more of the layer-3 switches 34X, 34Y and 34T of FIG. 2. See the specification at, for example, page 9, lines 13-18.

Dependent claim 35 specifies that a multicast detector prevents the layer-2 bridging of packets, irrespective of the IP destination address of the packets . The multicast detector in an

illustrative embodiment is implemented in one or more of the switches 34 shown in FIG. 2, utilizing processing operations shown in FIG. 3. See the specification at, for example, page 9, line 15 to page 10, line 20.

Dependent claim 36 specifies that the multicast detector prevents the layer-2 bridging of packets, irrespective of the MAC destination address of the packets. The multicast detector in an illustrative embodiment is implemented in one or more of the switches 34 shown in FIG. 2, utilizing processing operations shown in FIG. 3. See the specification at, for example, page 9, line 15 to page 10, line 20.

Dependent claim 37 specifies that the multicast detector prevents the layer-2 bridging of packets, irrespective of subscription information of hosts directly connected to the switch. The multicast detector in an illustrative embodiment is implemented in one or more of the switches 34 shown in FIG. 2, utilizing processing operations shown in FIG. 3. See the specification at, for example, page 9, line 15 to page 10, line 20.

Independent claim 38 is directed to a layer-3 switch, comprising at least one VLAN interface which does not have an associated Internet protocol (IP) router interface, and a layer-3 output unit which directs IP packets with a MAC source address of the switch through the at least one VLAN interface. The claim further specifies that the layer-3 output unit directs packets through the at least one VLAN interface, with an IP source address associated with a different VLAN interface of the switch. Illustrative embodiments of the switch recited in this claim may be viewed as one or more of the layer-3 switches 34X, 34Y and 34T of FIG. 2. See the specification at, for example, page 15, lines 13-22.

Independent claim 45 is directed to a method of forwarding packets, and includes the steps of receiving a packet with a source MAC address and a time to live (TTL) value, changing the source MAC address of the received packet, and forwarding the packet with the changed MAC address but with the same TTL value. Such a method may be implemented in the LAN 30 of FIG. 2. See the specification at, for example, page 13, lines 21-32.

Independent claim 48 is directed to a switch comprising a plurality of ports, a layer-3 multicast routing table, which identifies interfaces to which multicast packets should be routed according to both a VLAN and a port, and a multicast routing unit which routes multicast packets between the ports of the switch based on entries of the multicast routing table. The claim further

recites that the layer-3 multicast routing table may operate in a first mode in which interfaces are identified by both a VLAN and a port or in a second mode in which interfaces are identified only by a VLAN. Again, an illustrative embodiment of the claimed switch may be one of the layer-3 switches of LAN 30 in FIG. 2. See the specification at, for example, page 12, lines 6-14, and page 15, lines 23-31.

Generally, the claimed arrangements provide significant improvements in the routing of multicast packets relative to conventional systems. See the specification at, for example, page 4, lines 7-21.

GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

1. Claims 26, 28, 31-34, 38, 39 and 41-43 are rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 5,959,989 (hereinafter "Gleeson").

2. Claims 1-17, 27, 29, 30, 35-37, 40 and 48 are rejected under 35 U.S.C. §103(a) as being unpatentable over Gleeson in view of U.S. Patent No. 5,963,556 (hereinafter "Varghese").

3. Claims 45-47 are rejected under §103(a) as being unpatentable over Gleeson.

ARGUMENT

1. §102(e) Rejection of Claims 26, 28, 31-34, 38, 39 and 41-43

Claims 26, 28 and 31-34

The Manual of Patent Examining Procedure (MPEP), Eight Edition, August 2001, §2131, specifies that a given claim is anticipated "only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference," citing Verdegaal Bros. v. Union Oil Co. of California, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). Moreover, MPEP §2131 indicates that the cited reference must show the "identical invention . . . in as complete detail as is contained in the . . . claim," citing Richardson v. Suzuki Motor Co., 868 F.2d 1226, 1236, 9 USPQ2d 1913, 1920 (Fed Cir. 1989). Applicants submit that the Examiner has failed to establish anticipation of at least independent claim 26 by the Gleeson reference.

As noted above, independent claim 26 is directed to a switch comprising a plurality of ports, a layer-2 bridging unit which bridges packets between the ports responsive to their destination MAC address and their VLAN, and a multicast detector which identifies a group of at least some of the

IP multicast routing related packets received by the switch, the group including IGMP queries, and prevents the layer-2 bridging unit from bridging the identified packets at least through ports which do not lead to at least one neighboring layer-3 switch or router.

The Examiner argues that these limitations are met by the intermediate device 221 shown in FIG. 2A of Gleeson. However, there is no teaching or suggestion in Gleeson to the effect that the intermediate device 221 comprises a layer-2 bridging unit and a multicast detector which operate in the particular manner recited in the claim. Gleeson actually teaches away from such an arrangement by disclosing the use of multicast controller 306 which is separate from the intermediate device 221.

Dependent claims 28 and 31-34 are believed allowable for at least the reasons identified above with regard to independent claim 26.

Claims 38, 39 and 41-43

As noted above, independent claim 38 is directed to a layer-3 switch, comprising at least one VLAN interface which does not have an associated IP router interface, and a layer-3 output unit which directs IP packets with a MAC source address of the switch through the at least one VLAN interface. The claim further specifies that the layer-3 output unit directs packets through the at least one VLAN interface, with an IP source address associated with a different VLAN interface of the switch.

The Examiner argues that the limitations of claim 38 are met by the multicast network device (MND) 226 of Gleeson FIG. 2A. However, the relied-upon teachings, in column 12, lines 36-44, of Gleeson, fail to describe a layer-3 output unit which directs packets in the particular manner set forth in the claim. Accordingly, it is believed that claim 38 is not anticipated by Gleeson.

Dependent claims 39 and 41-43 are believed allowable for at least the reasons identified above with regard to independent claim 38.

2. §103(a) Rejection of Claims 1-17, 27, 29, 30, 35-37, 40 and 48

Claims 1-5 and 10-13

A proper *prima facie* case of obviousness requires that the cited references when combined must teach or suggest all the claim limitations, and that there be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to combine the references or to modify the reference teachings. See MPEP, Eighth Edition, August 2001, §706.02(j).

Applicants submit that the Examiner has failed to establish proper *prima facie* cases of obviousness in the §103(a) rejection of claims 1-13, in that the cited references, even if assumed to be combinable, fail to teach or suggest all the claim limitations, and in that no cogent motivation has been identified for combining the references or modifying the reference teachings to reach the claimed invention.

As indicated previously, independent claim 1 is directed to a method of determining local multicast information of a LAN, and includes the steps of dividing the LAN to a number of segments larger than the number of VLANs in the network, and creating a layer-3 multicast routing table, which relates to each of the segments separately.

The Examiner in formulating the §103(a) rejection acknowledges that Gleeson fails to disclose the claimed multicast routing table which relates to individual segments of a divided LAN as claimed, but argues that the source VLAN table 144 in FIG. 4 of Varghese supplies the missing teachings. See the July 14, 2006 Office Action at page 6, first and second paragraphs. Applicants respectfully disagree. The source VLAN table 144 in FIG. 4 of Varghese does not relate separately to each of the segments of a divided LAN as claimed. Instead, the source VLAN table 144 simply "associates 48-bit source addresses with VLANs" as indicated in column 7, lines 64-66. In other words, the source VLAN table 144 maps the address of a given source, such as Station A, to a corresponding VLAN, such as VLAN 1. See column 8, lines 1-5, of Varghese. Thus, the table relied on by the Examiner fails to relate separately to each of the segments of a particular LAN. The combined teachings of Gleeson and Varghese therefore fail to meet each and every limitation of independent claim 1.

Also, as indicated previously, the Examiner has failed to identify a cogent motivation for combining the Gleeson and Varghese references or modifying the reference teachings to reach the claimed invention.

The Federal Circuit has stated that when patentability turns on the question of obviousness, the obviousness determination "must be based on objective evidence of record" and that "this precedent has been reinforced in myriad decisions, and cannot be dispensed with." In re Sang-Su Lee, 277 F.3d 1338, 1343 (Fed. Cir. 2002). Moreover, the Federal Circuit has stated that "conclusory statements" by an examiner fail to adequately address the factual question of motivation, which is material to patentability and cannot be resolved "on subjective belief and unknown authority." Id. at 1343-1344. There has been no showing in the present § 103(a) rejection of objective evidence of record that would motivate one skilled in the art to combine the Gleeson and Varghese references to produce the particular limitations in question.

Instead, the Examiner states as follows in the July 14, 2006 Office Action at page 6, regarding independent claim 1 and the proposed combination of the Gleeson and Varghese references, with emphasis supplied:

> It would have been obvious to one of ordinary skill in the art at the time of the invention to implement the multicasting table of bridge ports of Vargese [sic] in the routing devices of Gleeson. One of ordinary skill in the art would have been motivated to do so in order to only transmits [sic] on bridge ports to hosts that are members of the corresponding multicast groups, thereby, reducing traffic flow and bandwidth as taught by Gleeson (See column 5, lines 27-40). An added benefit of doing so would result in reduced network congestion and costs due to decreased network traffic.

Applicants submit that this statement is a subjective and conclusory statement of obviousness, and insufficient to support the proposed combination of the reference teachings. It appears to recite advantages of the claimed invention as motivation for the proposed combination, which is improper. Also, as indicated previously, the source VLAN table 144 in FIG. 4 of Varghese, relied on by the Examiner, does not relate separately to segments of a divided LAN, and thus actually represents a teaching away from the claimed invention.

It therefore appears that the Examiner in formulating the §103(a) rejection of independent claim 1 over Gleeson and Varghese has undertaken a piecemeal reconstruction of the claimed invention based upon impermissible hindsight, given the benefit of the disclosure provided by Applicants.

Dependent claims 2-5 and 10-13 are believed allowable for at least the reasons identified above with regard to independent claim 1.

Claim 6

Dependent claim 6 specifies that dividing the LAN to a plurality of segments comprises dividing at least one of the VLANs of the LAN to a plurality of segments. The Examiner argues that this limitation is met by VLAN O and trunk lines 207, 230, 232, 234 and 210 in FIG. 2A of Gleeson. However, the relied-upon portion of Gleeson does not teach or suggest dividing the LAN into segments as claimed for purposes of creating a multicast routing table which relates to each of the segments separately. Accordingly, it is believed that the collective teachings of Gleeson and Varghese fail to meet the limitation in question.

Claim 7

Dependent claim 7 specifies that dividing the LAN to a plurality of segments comprises dividing such that each group of one or more links which connects two or more hosts, routers or layer-3 switches is a separate segment for each of the VLANs which pass on the group of links. The Examiner again relies on FIG. 2A of Gleeson, but the relied-upon portion of Gleeson does not teach or suggest dividing the LAN into segments as claimed for purposes of creating a multicast routing table which relates to each of the segments separately. Accordingly, it is believed that the collective teachings of Gleeson and Varghese fail to meet the limitation in question.

Claim 8

Dependent claim 8 specifies that dividing the LAN to a plurality of segments comprises dividing such that, for each VLAN, a backbone segment is defined as including all the groups of one or more links which connect two or more routers or layer-3 switches in the VLAN. The Examiner argues that this limitation is met by element 230 in FIG. 2A of Gleeson. However, Gleeson provides

no teaching or suggestion regarding dividing a LAN in the particular manner recited, for purposes of creating a multicast routing table which relates to each of the segments separately. Accordingly, it is believed that the collective teachings of Gleeson and Varghese fail to meet the limitation in question.

Claim 9

Dependent claim 9 specifies that the links not included in the backbone segment for each VLAN are divided to separate segments in each VLAN, each segment including a group of one or more links which connect one or more hosts to a router or layer-3 switch. The Examiner relies on element 208 in FIG. 2A of Gleeson as allegedly meeting this claim limitation, but there is no teaching or suggestion in Gleeson to the effect that the LAN therein is actually divided in the manner recited. Accordingly, it is believed that the collective teachings of Gleeson and Varghese fail to meet the limitation in question.

Claims 14-17

As noted above, independent claim 14 is directed to a method of forwarding multicast packets by a layer-3 switch, and includes the steps of receiving a multicast packet by the switch through a first physical port on a first VLAN, and routing the multicast packet in layer-3 out a second physical port of the switch, on the first VLAN. The claim further specifies that the multicast packet is bridged in layer-2 through a third physical port of the layer-3 switch.

The Examiner argues that the limitations of claim 14 are met by intermediate device 221 of FIG. 2A in Gleeson in combination with the source VLAN table 144 in FIG. 4 of Varghese. Applicants respectfully disagree. The intermediate device 221 of FIG. 2A is described in column 7, line 56, of Gleeson as "a switch or hub" generally, and not as a layer-3 switch as claimed. Moreover, there is no disclosure in Gleeson to the effect that the multicast packet is bridged in layer-2 through a third physical port of a layer-3 switch.

Thus, it is believed that the collective teachings of Gleeson and Varghese fail to meet the limitations of claim 14.

Also, the proffered statement of motivation to combine Gleeson and Varghese provided at pages 8-9 of the July 14, 2006 Office Action is believed to be deficient, for reasons similar to those identified above with regard to claim 1.

Dependent claims 15-17 are believed allowable for at least the reasons identified above with regard to independent claim 14.

Claims 27, 29 and 30

Dependent claims 27, 29 and 30 are believed allowable for at least the reasons identified above with regard to independent claim 26.

Claim 35

Dependent claim 35 specifies that a multicast detector prevents the layer-2 bridging of packets, irrespective of the IP destination address of the packets. The Examiner argues that such an arrangement is shown in the proposed combination of Gleeson and Varghese, but fails to identify the particular teachings relied upon to reach this conclusion. See page 9, second to last paragraph, of the July 14, 2006 Office Action. Applicants respectfully disagree with the argument. It is believed that there is no teaching or suggestion in Gleeson, Varghese, or the collective disclosure of Gleeson and Varghese, to the effect that a multicast detector can prevent layer-2 bridging irrespective of IP destination address.

Claim 36

Dependent claim 36 specifies that the multicast detector prevents the layer-2 bridging of packets, irrespective of the MAC destination address of the packets. The Examiner argues that such an arrangement is shown in Gleeson as modified by Varghese, but fails to identify the particular teachings relied upon to reach this conclusion. See page 9, second to last paragraph, of the July 14, 2006 Office Action. Applicants respectfully disagree with the argument. It is believed that there is no teaching or suggestion in Gleeson, Varghese, or the collective disclosure of Gleeson and Varghese, to the effect that a multicast detector can prevent layer-2 bridging irrespective of MAC destination address.

Claim 37

Dependent claim 37 specifies that the multicast detector prevents the layer-2 bridging of packets, irrespective of subscription information of hosts directly connected to the switch. The Examiner argues that such an arrangement is shown in Gleeson as modified by Varghese, but fails to identify the particular teachings relied upon to reach this conclusion. See page 9, second to last paragraph, of the July 14, 2006 Office Action. Applicants respectfully disagree with the argument. It is believed that there is no teaching or suggestion in Gleeson, Varghese, or the collective disclosure of Gleeson and Varghese, to the effect that a multicast detector can prevent layer-2 bridging irrespective of host subscription information.

Claim 40

Dependent claim 40 is believed allowable for at least the reasons identified above with regard to independent claim 38.

Claim 48

As noted above, independent claim 48 is directed to a switch comprising a plurality of ports, a layer-3 multicast routing table, which identifies interfaces to which multicast packets should be routed according to both a VLAN and a port, and a multicast routing unit which routes multicast packets between the ports of the switch based on entries of the multicast routing table. The claim further recites that the layer-3 multicast routing table may operate in a first mode in which interfaces are identified by both a VLAN and a port or in a second mode in which interfaces are identified only by a VLAN.

The Examiner in rejecting claim 48 relies on FIG. 2A of Gleeson and the source VLAN table 144 in FIG. 4 of Varghese. The Examiner apparently argues that the source VLAN table 144 can operate in both a first mode and a second mode as recited in the claim. However, Varghese teaches that the source VLAN table 144 is used in only what is referred to Method 2, in which the table associates 48-bit source addresses with VLANs. See Varghese at column 7, lines 63-66. An alternative method, referred to as Method 1 in Varghese, apparently does not make use of the source VLAN table 144. Accordingly, the proposed combination of Gleeson and Varghese does not disclose or suggest the claimed table capable of operation in first or second modes. Thus, the

collective teachings of the cited references fail to particular type of multiple mode operation recited in claim 48.

3. §103(a) Rejection of Claims 45-47

As noted above, independent claim 45 is directed to a method of forwarding packets, and includes the steps of receiving a packet with a source MAC address and a TTL value, changing the source MAC address of the received packet, and forwarding the packet with the changed MAC address but with the same TTL value.

The Examiner in rejecting claim 45 under §103(a) over Gleeson argues that the limitations are shown in column 12, line 40, column 13, lines 50-52, and in the frames 402a of FIG. 4A and 610 of FIG. 6. Applicants respectfully disagree. Gleeson at column 13, lines 50-52, states as follows:

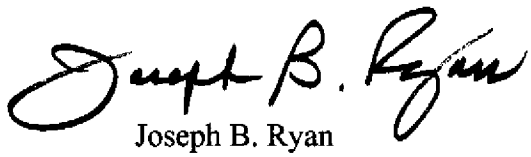
> The controller 306 may perform conventional routing functions to the IP header field 404, such as decrementing a time-to-live (TTL) value (not shown).

The Examiner characterizes this teaching as allegedly disclosing the forwarding of a packet with a changed MAC address but with the same TTL value as claimed. However, the relied-upon passage does not imply that a packet will be forwarded without decrementing its TTL value. Instead, it simply states that the performance of conventional routing functions is optional. This is because the "may" in the relied-upon passage applies to the performance of conventional routing functions. Once a decision is made to configure the controller 306 to perform a conventional routing function, such as decrementing the TTL value, it will apparently always decrement that value, as would be expected in accordance with conventional practice. The relied-upon teachings thus not only fail to meet the limitations in question, but actively teach away from them. Independent claim 45 is therefore not obvious in view of Gleeson.

Dependent claims 46 and 47 are believed allowable for at least the reasons identified above with regard to independent claim 45.

In view of the above, Applicants believe that claims 1-17, 26-43 and 45-48 are in condition for allowance, and respectfully request the withdrawal of the §102(e) and §103(a) rejections.

Respectfully submitted,



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CLAIMS APPENDIX

1. A method of determining local multicast information of a local area network (LAN), comprising:

dividing the LAN to a number of segments larger than the number of virtual LANs (VLANs) in the network; and

creating a layer-3 multicast routing table, which relates to each of the segments separately.

2. A method according to claim 1, wherein the layer-3 multicast routing table lists in each of its entries the segments to which matching packets should be routed.

3. A method according to claim 1, wherein the layer-3 multicast routing table identifies interfaces according to a VLAN and a port.

4. A method according to claim 1, wherein the layer-3 multicast routing table lists, for substantially each entry, a legal interface which is identified by a VLAN and a port.

5. A method according to claim 1, wherein dividing the LAN to a plurality of segments comprises dividing such that at least some of the segments are physically distinct.

6. A method according to claim 1, wherein dividing the LAN to a plurality of segments comprises dividing at least one of the VLANs of the LAN to a plurality of segments.

7. A method according to claim 1, wherein dividing the LAN to a plurality of segments comprises dividing such that each group of one or more links which connects two or more hosts, routers or layer-3 switches is a separate segment for each of the VLANs which pass on the group of links.

8. A method according to claim 1, wherein dividing the LAN to a plurality of segments comprises dividing such that, for each VLAN, a backbone segment is defined as including all the groups of one or more links which connect two or more routers or layer-3 switches in the VLAN.

9. A method according to claim 8, wherein the links not included in the backbone segment for each VLAN are divided to separate segments in each VLAN, each segment including a group of one or more links which connect one or more hosts to a router or layer-3 switch.

10. A method according to claim 1, wherein managing multicast related information for each of the segments separately comprises determining for each segment separately whether multicast packets should be routed to the segment.

11. A method according to claim 1, wherein managing multicast related information for each of the segments separately comprises performing the IGMP protocol in each of the segments separately.

12. A method according to claim 1, wherein the layer-3 switches of the LAN do not forward IP multicast routing related packets in layer-2.

13. A method according to claim 1, wherein the layer-3 switches of the LAN do not perform multicast filtering in layer-2.

14. A method of forwarding multicast packets by a layer-3 switch, comprising:

receiving a multicast packet by the switch through a first physical port on a first VLAN; and

routing the multicast packet in layer-3 out a second physical port of the switch, on the first VLAN;

wherein the multicast packet is bridged in layer-2 through a third physical port of the layer-3 switch.

15. A method according to claim 14, wherein routing the multicast packet comprises reducing the time to live (TTL) value of the packet.

16. A method according to claim 14, wherein the second physical port leads to at least one layer-3 switch or router.

17. A method according to claim 14, wherein the multicast packet is not bridged in layer-2 through the second physical port.

18. (Canceled)

19. (Canceled)

20. (Canceled)

21. (Canceled)

22. (Canceled)

23. (Canceled)

24. (Canceled)

25. (Canceled)

26. A switch, comprising:

a plurality of ports;

a layer-2 bridging unit which bridges packets between the ports responsive to their destination MAC address and their VLAN; and

a multicast detector which identifies a group of at least some of the IP multicast routing related packets received by the switch, the group including IGMP queries, and prevents the layer-2

bridging unit from bridging the identified packets at least through ports which do not lead to at least one neighboring layer-3 switch or router.

27. A switch according to claim 26, wherein the multicast detector prevents the layer-2 bridging unit from bridging the identified packets through any of the ports of the switch.

28. A switch according to claim 26, wherein the layer-2 bridging unit bridges at least some of the identified packets through a plurality of ports.

29. A switch according to claim 26, wherein the multicast detector allows bridging in layer-2 of at least some of the identified packets, through one or more ports which lead to at least one neighboring layer-3 switch or router.

30. A switch according to claim 29, wherein the bridging unit bridges in layer-2 packets received through a port which leads to at least one other layer-3 switch or router, through other ports which lead to at least one neighboring layer-3 switch or router.

31. A switch according to claim 26, wherein the multicast detector identifies the packets at least responsive to their protocol field.

32. A switch according to claim 26, wherein the group of packets identified by the multicast detector comprises substantially all the IP multicast routing related control packets received by the switch.

33. A switch according to claim 32, wherein the group of packets identified by the multicast detector comprises substantially all the IP multicast routing related packets received by the switch.

34. A switch according to claim 26, comprising a layer-3 routing unit which routes at least some IP multicast routing related packets between ports of the same VLAN.

35. A switch according to claim 26, wherein the multicast detector prevents the layer-2 bridging of packets, irrespective of the IP destination address of the packets.

36. A switch according to claim 26, wherein the multicast detector prevents the layer-2 bridging of packets, irrespective of the MAC destination address of the packets.

37. A switch according to claim 26, wherein the multicast detector prevents the layer-2 bridging of packets, irrespective of subscription information of hosts directly connected to the switch.

38. A layer-3 switch, comprising:

at least one VLAN interface which does not have an associated IP router interface; and

a layer-3 output unit which directs IP packets with a MAC source address of the switch through the at least one VLAN interface;

wherein the layer-3 output unit directs packets through the at least one VLAN interface, with an IP source address associated with a different VLAN interface of the switch.

39. A switch according to claim 38, wherein the packets directed through the at least one VLAN interface, by the layer-3 output unit, include IP packets routed by the switch in layer-3.

40. A switch according to claim 38, wherein the packets directed through the at least one VLAN interface, by the layer-3 output unit, include IP packets generated by a higher layer of the switch.

41. A switch according to claim 38, wherein the packets directed through the at least one VLAN interface, by the layer-3 output unit, include packets of a routing protocol.

42. A switch according to claim 38, wherein the packets directed through the at least one VLAN interface, by the layer-3 output unit, include IP multicast packets.

43. A switch according to claim 42, wherein the packets directed through the at least one VLAN interface, by the layer-3 output unit, include IP multicast routing related control packets.

44. (Canceled)

45. A method of forwarding packets, comprising:

receiving a packet with a source MAC address and a TTL value;

changing the source MAC address of the received packet; and

forwarding the packet with the changed MAC address but with the same TTL value.

46. A method according to claim 45, wherein receiving the packet comprises receiving an IP multicast data packet.

47. A method according to claim 45, wherein forwarding the packet comprises forwarding within the same VLAN from which the packet was received.

48. A switch, comprising:

a plurality of ports;

a layer-3 multicast routing table, which identifies interfaces to which multicast packets should be routed according to both a VLAN and a port; and

a multicast routing unit which routes multicast packets between the ports of the switch based on entries of the multicast routing table;

wherein the layer-3 multicast routing table may operate in a first mode in which interfaces are identified by both a VLAN and a port or in a second mode in which interfaces are identified only by a VLAN.

49. (Canceled)

EVIDENCE APPENDIX

None

RELATED PROCEEDINGS APPENDIX

None